

SCIURODENDRIUM GARDNERI, NEW SPECIES (NEMATODA:
TRICHOSTRONGYLOIDEA: HELIGMONELLIDAE), A
PARASITE OF *SCIURUS CAROLINENSIS* GMELIN,
1788 (MAMMALIA: SCIURIDAE), WITH COMMENTS
ON THE BIOGEOGRAPHY OF *SCIURODENDRIUM*
DURETTE-DESSET, 1971

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Abstract.—*Sciurodendrium gardneri*, new species, is described from an eastern gray squirrel, *Sciurus carolinensis*, collected in Virginia, U.S.A. A nearctic origin for the genus *Sciurodendrium* is proposed on the basis of the paleobiogeography of the host.

Sciurodendrium Durette-Desset, 1971, is a genus found only in New World squirrels (Sciuridae). There are five known species (Durette-Desset & Justine 1992): one nearctic, *Sciurodendrium hassalli* (Price 1929); and four neotropical, *S. oliverai* (Lent & Freitas 1938), *S. hepaticum* (Lent & Freitas 1938), *S. aripense* (Baylis 1947), and *S. landauae* (Durette-Desset 1970). *Sciurodendrium hassalli* is the name that has been used for heligmonellid parasites of squirrels in the United States (Harkema 1936, Chandler 1942) on the assumption that there was only one species of this genus in the Northern Hemisphere. However, a routine examination for parasites in an eastern gray squirrel from Virginia revealed an undescribed species.

The parasites were collected in an isotonic solution of NaCl, preserved in ethanol (70%), and clarified in lactophenol. All measurements are in microns and given as the mean followed by the range in parentheses. Types are deposited in the US National Parasite Collection, USDA, ARS Beltsville, Maryland (USNP), and the Colección de Parasitología, Museo de Biología, Universidad Central de Venezuela, Caracas (CPMBUCV).

Sciurodendrium gardneri, new species

Description.—Heligmonellidae, Pudicinae; small slender worms, reddish in color when fresh. Cuticle of the anterior end dilated and coarsely striated. The mouth opening is triangular and bears an internal ring of six small papillae and an external ring consisting of the amphids and four well-developed papillae (Fig. 1A). Synlophe with a well-developed carene consisting of two continuous ridges (Fig. 1C). In addition, the synlophe includes nine dorsal discontinuous ridges arranged in nonalternating interrupted longitudinal lines and eight ventral discontinuous ridges in alternating lines (Fig. 1D) resulting in the doubled number of ventral ridge “tips” seen in cross-sectional view (Fig. 1C).

Male (10 specimens): Body 3720 (3179–4493) long by a maximum width of 82 (74–94) near mid body. Cephalic vesicle is 52 (47–57) long and 32 (28–38) wide. Esophagus is simple, 250 (208–288) long. Nerve ring and excretory pore located 146 (132–165) and 169 (154–184), respectively, from the anterior end. Caudal bursa is type 2-2-1 and the dorsal ray is deeply cleft to the level of the origin of 8th ray; ray 9 shorter and

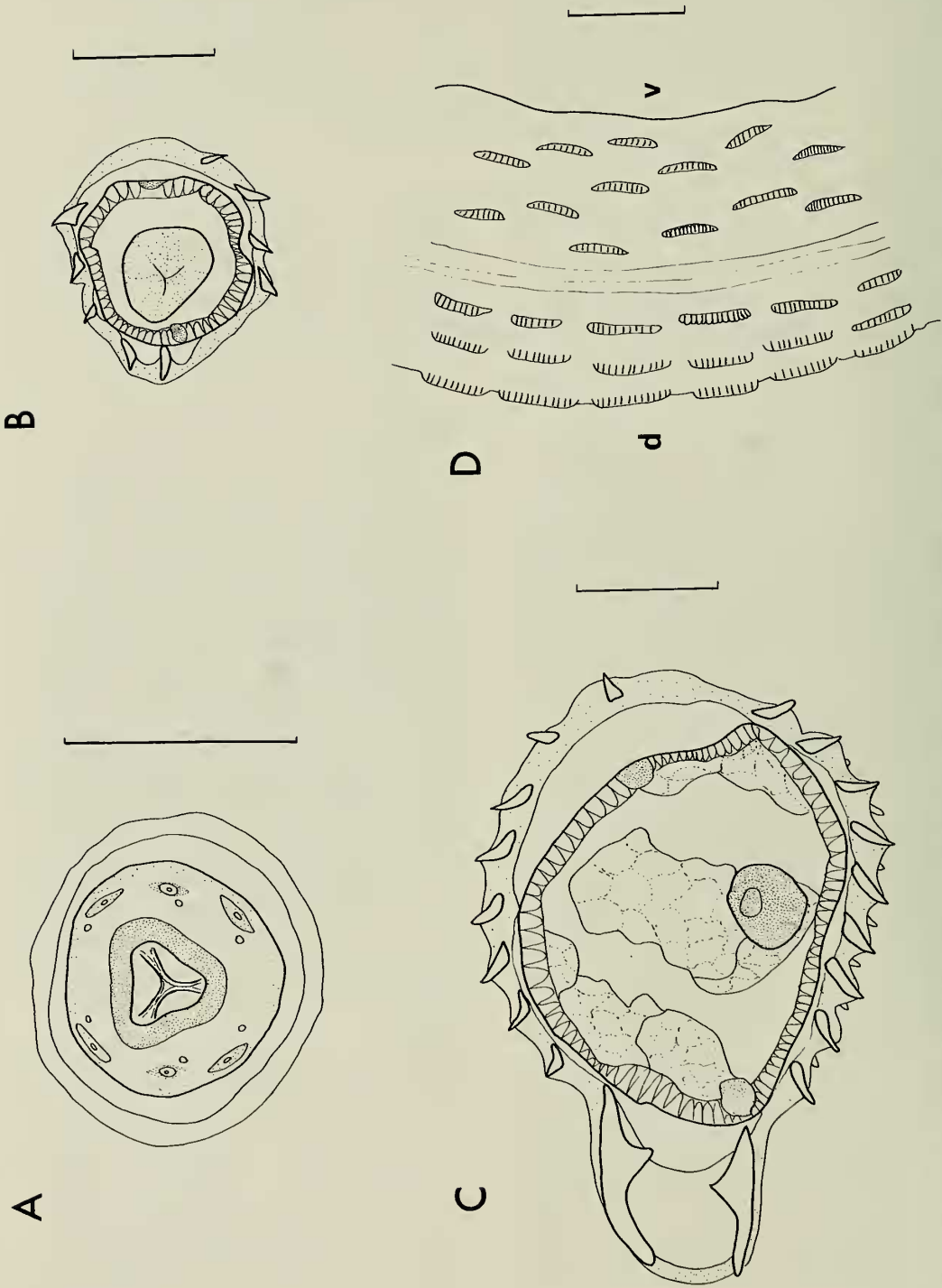


Fig. 1. *Sciuroidendrium gardneri*, new species: A, ♀, apical view; B, ♀, cross-section showing synlophe at level of base of cephalic vesicle; C, ♀, cross-section showing synlophe near mid-length of body; D, ♀, view of longitudinal ridges from right side (d = dorsal, v = ventral surface). Each bar equals 25 μ .

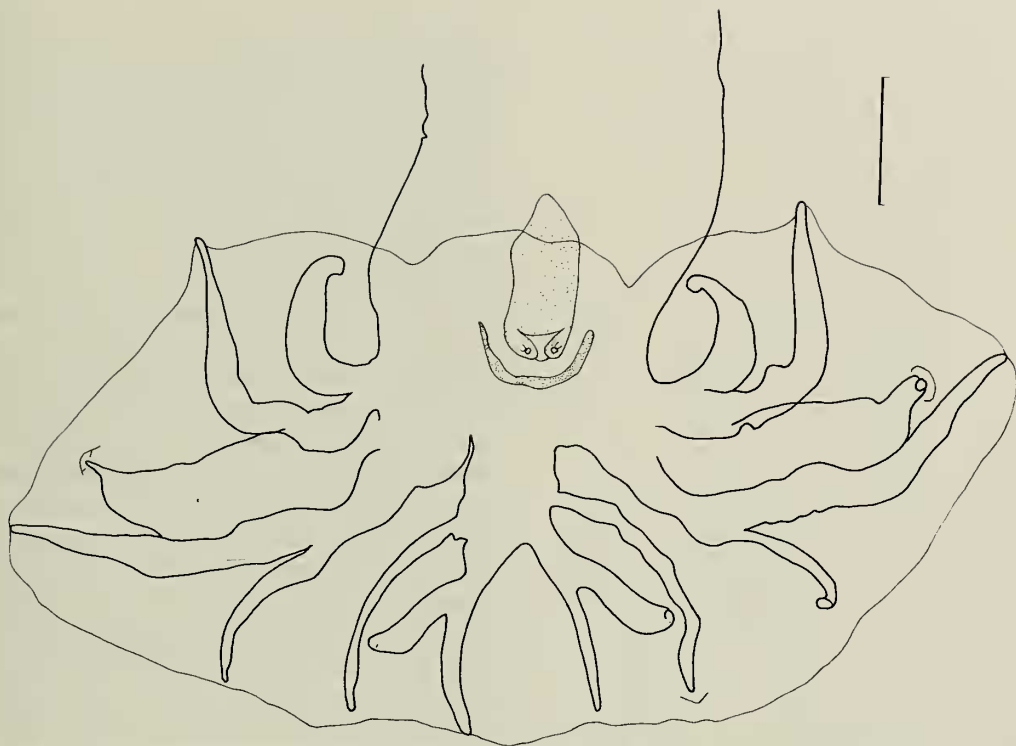


Fig. 2. *Sciurodendrium gardneri*, new species: ♂, posterior end showing characteristics of bursa and rays. Bar equals 25 μ .

thicker than ray 10; ray 4 gross and with papilliform end; ray 6 arises from basal third of ray 5 (Fig. 2). Spicules are subequal, filiform, alate, fused at the tips, and measure 370 (334–420) long and 4–5 wide. Telamon is elongated, weakly cutinized, and located close to cloacal papillae. A gubernaculum is absent.

Female (10 specimens measured): Body 5360 (4801–5881) long with a maximum width of 98 (92–104). Cephalic vesicle is 54 (48–60) long and 33 (30–37) wide. Esophagus is simple, 272 (246–298) long. Nerve ring and excretory pore situated 187 (156–210) and 221 (200–254), respectively, from the anterior end (Fig. 3).

Vulva located 173 (156–188) from the posterior end of the body, and followed by a vagina vera 31 (24–40) in length, a vestibule 87 (76–100) long, a sphincter 33 (28–40) long, and an infundibulum 140 (94–210)

long (Fig. 4). Uterus measures 316 (220–490) in length and contains 6 (4–7) thin-shelled eggs, each measuring 73 (68–84) by 38 (36–42). Tail is 84 (59–108) in length.

Host: *Sciurus carolinensis* Gmelin, 1788 (Rodentia: Sciuridae)

Location: Small intestine.

Locality: Oakton, Fairfax Co., Virginia, U.S.A.

Type specimens:

Holotype: CP-MBUCV No. 3942 (male).

Allotype: CP-MBUCV No. 3943 (female).

Paratypes: CP-MBUCV No. 3109 (19 males and 11 females); USNM Helm. Collection No. 82704 (2 males and 2 females).

Etymology.—Patronym, in honor of Alfred L. Gardner, of U.S. National Biological Survey, due to his very important contributions to Neotropical mammalogy.

Remarks.—*Sciurodendrium gardneri* is

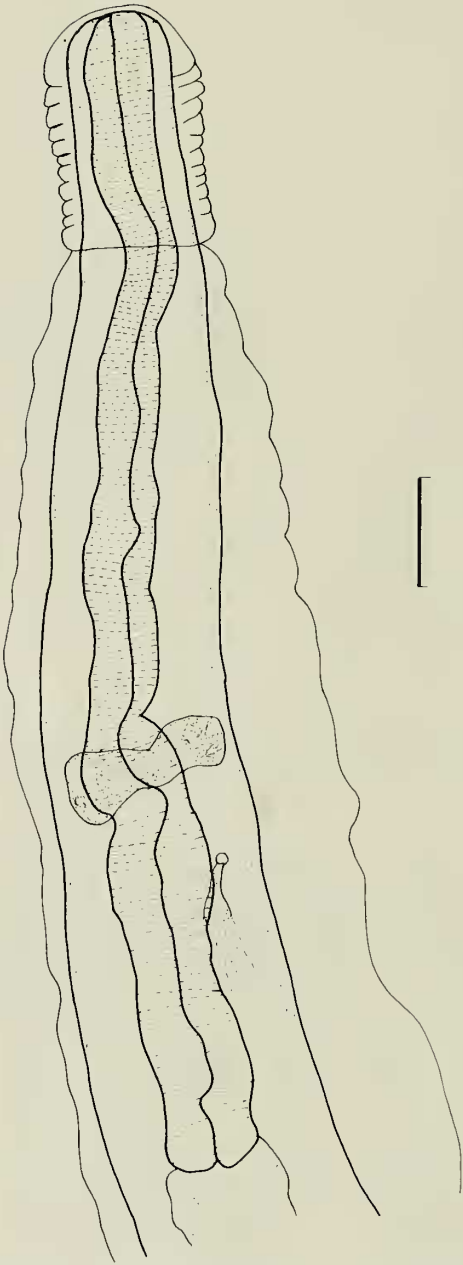


Fig. 3. *Sciurodendrium gardneri*, new species: ♀, anterior end of body showing positions of nerve ring and excretory pore. Bar equals 25 μ .

similar to *S. hassallii* and *S. oliverai* and differs from other known congeners on the basis of small body size and deeply cleft dorsal ray of caudal bursa (cleft to level of

origin of ray 8). It differs from *S. hassallii* and *S. oliverai* in that rays 4 and 9 are conspicuously gross and broader than the other rays. All rays in *S. hassallii* are thin as is usual in other members of the group. Also, *S. gardneri* is smaller than *S. hassallii* in size and differs from *S. oliverai* in having a telamon (absent in the latter).

Discussion.—Durette-Desset (1985:290) stated “Trichostrongyloids of Neotropical Sciuridae belong to a single genus, *Sciurodendrium*, a Pudicinae derived from forms in Caviomorph rodents.” “It is therefore likely that the Sciuridae lost their brevis-triatine parasites during their migration into North America [from the Old World] and were reinfected after contacting South American pudicines.”

Durette-Desset (1971) introduced this hypothesis in her revision of heligmosomes, and has repeated it in subsequent papers (Durette-Desset 1982, 1985; Durette-Desset & Chabaud 1977, 1981; Durette-Desset & Justine 1991). However, my finding another species of *Sciurodendrium* in a North American squirrel and a review of holarctic heligmonellids does not support Durette-Desset’s (1985) hypothesis on the origin of pudicine parasites of squirrels.

The Sciuridae are known in Europe from the Lower Oligocene (± 35 million years ago [mya]; Hartenberg 1985), in North America from the Hemingfordian (± 16 mya; Webb 1985), but only recently in South America from the Lujanensian (< 1 mya; Reig 1981). Two major intercontinental migrations, first across Beringia into North America and then across the Isthmus of Panamá (Moore 1961), occurred before squirrels became established and radiated in South America. Durette-Desset (1985:290) wrote “We believe that sciurids were devoid of trichostrongyloids when they moved into South America. Trichostrongyloids are rare in holarctic Sciuridae and those that exist belong to a recent family, the Heligmosomidae.” According to the cladistic analysis of Durette-Desset & Justine (1992), *Sciuro-*

dendrium must have appeared only a few hundred thousand years ago and evolved from parasites of the caviomorph families Dasyproctidae, Echimyidae, and especially the Capromyidae. An alternative explanation is that sciurids entering South America carried brevistriatine heligmonellids, and that pudicines subsequently acquired from caviomorph rodents quickly displaced brevistriatines in all New World squirrels.

My research suggests, however, that neither of these hypotheses is supported by the evidence. Other Recent mammals that entered South America from North America retained their trichostrongyloid parasites. For example, *Longistriata*, a genus of parasites of holarctic Soricidae also is present in South American shrews (Guerrero 1982). The same is true for *Vexillata*, a parasite (Guerrero 1984) of the Heteromyidae, a New World rodent family that has its greatest diversity in North America. It seems unlikely that the Sciuridae were without trichostrongyloids throughout their 16-million-year history in North America before they were able to disperse across the Panamanian isthmus. If derived from caviomorph rodents, how did *Sciurodendrium* reach temperate North America? There is no evidence of a "reverse" migration of sciurids from South America northward.

Durette-Desset (1971) commented that *Brevistriata* (Brevistriatinae), a parasite of Oriental Sciuridae, and *Sciurodendrium*, a parasite of New World sciurids, are quite similar. This she attributed to convergence, pointing out that in the former the cuticular ridges are discontinuous and in alternating lines, and ray 4 is equal to or longer than the 5th. The characteristics I describe above for *S. gardneri* show that discontinuous alternating cuticular ridges are not diagnostic only of *Brevistriata*. Relative lengths of rays 4 and 5 may be the only remaining major diagnostic character distinguishing the two subfamilies.

I suggest that *Sciurodendrium* is nearctic in origin and closely related to some Brev-



Fig. 4. *Sciurodendrium gardneri*, new species: ♀, posterior end of body. Bar equals 25 μ .

istriatinae such as, for example, *Calypsostrongylus* Schmidt, Myers & Kuntz, 1967, sensu Durette-Desset (1976). Relationships between Old World Brevistriatinae and Western Hemisphere Pudicinae need to be reexamined.

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